



**MARIA L. LACAL**  
Senior Vice President  
Nuclear Regulatory and Oversight

**Palo Verde**  
**Nuclear Generating Station**  
P.O. Box 52034  
Phoenix, AZ 85072  
Mail Station 7605  
Tel 623 393 6491

102-07744-MLL/LMW  
July 20, 2018

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 2**  
**Docket No. STN 50-529 / License No. NPF 51**  
**Licensee Event Report 2018-001-00**

Enclosed please find Licensee Event Report (LER) 50-529/2018-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic actuation of the PVNGS Unit 2 reactor protection system.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the Nuclear Regulatory Commission (NRC) Regional Office, NRC Region IV, and the Senior Resident Inspector.

Arizona Public Service Company makes no commitments in this letter. If you have questions regarding this submittal, please contact Matthew Kura, Department Leader, Nuclear Regulatory Affairs, at (623) 393-5379.

Sincerely,

A handwritten signature in blue ink, appearing to read "Maria L. Lecal", is written over a faint, larger version of the same signature.

MLL/LMW

Enclosure

cc:	K. M. Kennedy	NRC Region IV Regional Administrator
	M. D. Orenak	NRC NRR Project Manager for PVNGS
	C. A. Peabody	NRC Senior Resident Inspector PVNGS





## LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-mv/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollect.Resource@nrc.gov](mailto:Infocollect.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name Palo Verde Nuclear Generating Station (PVNGS) Unit 2	2. Docket Number 05000529	3. Page 1 OF 4
--	------------------------------	-------------------

4. Title  
Unit 2 Reactor Trip Due to Dropped Control Element Assembly

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
05	23	2018	2018	- 001	- 00	07	20	2018	Facility Name	Docket Number
										05000
									Facility Name	Docket Number
										05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level  100	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(iii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)	

## 12. Licensee Contact for this LER

Licensee Contact

Matthew Kura, Department Leader, Nuclear Regulatory Affairs

Telephone Number (Include Area Code)

623-393-5379

## 13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To ICES	Cause	System	Component	Manufacturer	Reportable To ICES
X	AA	CON	E146	Y					

## 14. Supplemental Report Expected

☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No

## 15. Expected Submission Date

Month	Day	Year

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On May 23, 2018, at approximately 1128 Mountain Standard Time, the PVNGS Unit 2 control room received a reactor protection system alarm for low departure from nucleate boiling ratio and an automatic reactor trip occurred as a result of a dropped control element assembly (CEA). The trip occurred coincident with maintenance on control element drive mechanism control system (CEDMCS) fuses and fuse caps.

The cause of the dropped CEA and resulting Unit 2 trip was a CEDMCS lower logic assembly misalignment that caused difficulty seating circuit cards. Maintenance activities adversely affected card edge connections of the circuit card that led to a dropped control element assembly. Corrective actions restored the subgroups 15 and 16 circuit cards to a fully seated position.

No major equipment was inoperable prior to the event that contributed to the event or complicated operator response. Units 1 and 3 were not impacted.

No similar conditions have been reported by PVNGS in the past three years.





## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Palo Verde Nuclear Generating Station (PVNGS) Unit 2	05000-529	YEAR  2018	SEQUENTIAL NUMBER  - 001	REV NO.  - 00

### NARRATIVE

All times are Mountain Standard Time and approximate unless otherwise indicated.

#### 1. REPORTING REQUIREMENT(S):

This Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv)(A) to report an automatic actuation of the PVNGS Unit 2 Reactor Protection System (RPS) (EIS: JC) that occurred as a result of a dropped control element assembly (CEA) (EIS: AA) while maintenance activities were in progress in the control element drive mechanism control system (CEDMCS) (EIS: AA). The RPS generated trips on all four channels for low departure from nucleate boiling ratio (DNBR) and high local power density (LPD).

This event was reported to the NRC pursuant to 10 CFR 50.72 (b)(2)(iv)(B) on May 23, 2018 at 1437, via the emergency notification system (EN 53424).

#### 2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

##### Control Element Drive Mechanism Control System

The CEDMCS provides control signals and motive power to the coils in the control element drive mechanisms (CEDM) (EIS: AA) which position and hold the 89 CEAs. The CEDMCS controls the direction, rate and duration of motion of the CEAs either automatically or manually, and moves the CEAs individually or as groups.

The CEDM for the CEAs within a subgroup are provided power from a common power switch assembly. The subgroups are arranged into nine groups: two shutdown, five regulating, and two part strength groups. Motion signals are received and processed by the CEA enable card and passed to the automatic CEDM timer module (ACTM) card for each CEA. The ACTM cards provide signals which coordinate the application of voltage across CEDM coils that control CEA motion.

The subgroup logic housings are powered by 13 volt direct current logic power supplies. Redundant power supplies provide power to the individual subgroup logic housings through a 3 ampere fuse.

As a means of coping with failed electronics and an extended corrective maintenance evolution, an installed hold bus provides alternative power to the CEDM coils. Not more than one subgroup can be held on the hold bus at one time.

##### Core Protection Calculator/Control Element Assembly Calculator

The core protection calculator/control element assembly calculator (CPC/CEAC) (EIS: JC) system monitors reactor core conditions to provide CEA withdrawal prohibit signals to the CEDMCS and an accurate, reliable means of initiating a reactor trip. The CPC/CEAC system is an integral part of the plant protective system in that it provides low DNBR and high LPD trip signals to the RPS. Trip signals are provided to the RPS when the calculated DNBR or LPD exceed setpoints during reactor operation.

##### Reactor Protection System

The RPS ensures the reactor is rapidly and reliably shut down to protect the fission product barriers and to actuate engineered safety features systems in accident mitigation. The RPS actuation then causes simultaneous trips of the four reactor trip switchgear breakers (EIS: AA) which are aligned in a selective two of four configuration to de-energize the CEDMs so that all CEAs are released to insert into the reactor core and shut down the reactor.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Palo Verde Nuclear Generating Station (PVNGS) Unit 2	05000-529	2018	- 001	- 00
<b>3. INITIAL PLANT CONDITIONS:</b>				
<p>On May 23, 2018, PVNGS Unit 2 was in Mode 1 (Power Operation) at 100 percent power with the reactor coolant system at normal operating temperature and normal operating pressure. There were no other structures, systems, or components out of service that contributed to this event.</p>				
<b>4. EVENT DESCRIPTION:</b>				
<p>On May 23, 2018, at approximately 1128, the PVNGS Unit 2 control room received a RPS alarm for low DNBR and an automatic reactor trip occurred. The trip occurred coincident with maintenance being performed on the CEDMCS fuses and fuse caps.</p>				
<p>CEA 64 in subgroup 16 dropped into the core due to its individual circuit breaker tripping open while repairs were in progress to replace logic power fuses and fuse holder caps in the CEDMCS CEA subgroups 15 and 16 subgroup logic housing.</p>				
<p>Operations had placed the CEDMCS subgroup 15 on the hold bus. Technicians had replaced the subgroup 15 logic power fuse and fuse holder cap and were in the process of reseating subgroup 15 ACTM cards when unexpected indications associated with the subgroup 16 ACTM card for CEA 64 were observed. Subgroup 16 is located directly adjacent to subgroup 15 in the subgroup logic housing ACTM card cage and shares a common backplane.</p>				
<p>No other RPS actuation signals or actuations of plant engineered safety features systems occurred and all CEAs fully inserted into the reactor core. Control room personnel performed the standard post trip actions and diagnosed an uncomplicated reactor trip.</p>				
<b>5. ASSESSMENT OF SAFETY CONSEQUENCES:</b>				
<p>This event did not result in a challenge to the fission product barriers or result in the release of radioactive materials to the environment. There were no actual safety consequences as a result of this event and it did not adversely affect the health and safety of the public.</p>				
<p>The RPS functioned as designed and initiated an automatic reactor trip that placed the plant in a safe condition. Control room staff entered the standard post trip actions and diagnosed an uncomplicated reactor trip. All CEAs fully inserted into the reactor core.</p>				
<p>The Unit 2 reactor trip did not result in a transient more severe than those already analyzed. The primary system and secondary pressure boundary limits were not approached.</p>				
<b>6. CAUSE OF THE EVENT:</b>				
<p>The cause of the dropped CEA and resulting Unit 2 trip was a CEDMCS lower logic assembly misalignment that caused difficulty seating circuit cards. Maintenance activities adversely affected card edge connections of the circuit card that led to a high current condition, which tripped the individual circuit breaker, and dropped CEA 64.</p>				
<b>7. CORRECTIVE ACTIONS:</b>				
<p>Corrective actions included restoration of subgroup 15 ACTM cards in a fully seated position, replacement of subgroup 16 CEA 64 ACTM card, and post-maintenance testing.</p>				



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-m/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Palo Verde Nuclear Generating Station (PVNGS) Unit 2	05000-529	2018	- 001	- 00

The following additional actions are planned:

- Re-align Unit 2 subgroup logic housing timer card cage assembly during next refueling outage per vendor recommendations.
- Initiate preventative maintenance work order for remaining units to inspect all ACTM card alignment and edge connector seating and correct any discrepancies

The investigation is ongoing. Any significant changes to cause or corrective actions taken as a result of this event will be implemented in accordance with the PVNGS corrective action program. If information is subsequently developed that would significantly affect a reader's understanding or perception of this event, a supplement to this LER will be submitted.

**8. PREVIOUS SIMILAR EVENTS:**

There were no previous similar occurrences of a dropped CEA resulting in a reactor trip during CEDMCS maintenance.